

REMARKS

Claims 27-42 are pending in this application. The Office has rejected claims 27-42 under the judicially created doctrine of double patenting over claims 1-26 of U.S. Patent No. 6,608,931 and claims 1-21 of U.S. Patent 6,741,740. In addition, the Office has rejected claims 27-29, and 31-42 as follows: claim 28 is rejected under 35 U.S.C. § 112, second paragraph; claims 27, 29, 31-33, and 35-41 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Yi-Hsing Tseng (Spectral Mixture Analysis of Hyperspectral Data) in view of Eugene W. Martin (Measurement of Impervious Surface Area from Landsat Thematic Mapper Data using Spectral Mixture Analysis); claim 34 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Yi-Hsing Tseng (Spectral Mixture Analysis of Hyperspectral Data) in view of Eugene W. Martin (Measurement of Impervious Surface Area from Landsat Thematic Mapper Data using Spectral Mixture Analysis) and U.S. Patent 6,008,492 to Slater et al; and claim 42 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Yi-Hsing Tseng (Spectral Mixture Analysis of Hyperspectral Data) in view of Eugene W. Martin (Measurement of Impervious Surface Area from Landsat Thematic Mapper Data using Spectral Mixture Analysis) and ENVI Tutorial # 10 (Advanced Hyperspectral Analysis). In addition, the Office has stated that claims 28 and 30 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form and rewritten to overcome the § 112, second paragraph rejection with respect to claim 28.

In view of the remarks herein, the undersigned respectfully requests reconsideration of these rejections.

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Rejection of Claims 27-42 under Judicially Created Doctrine of Double Patenting

The Office has rejected claims 27-42 under the judicially created doctrine of double patenting. In light of the arguments made below with respect to other rejections of pending claims, the undersigned believes that responding to this rejection is premature at this time and respectfully reserves the right to respond appropriately to this rejection after the Office has reached a further decision with respect to the arguments presented below.

Rejection of Claim 28 under 35 U.S.C. § 112, Second Paragraph

The Office has rejected claim 28 under 35 U.S.C. § 112, second paragraph, stating that claim 28 recites the limitation "a second criteria threshold" without reciting "a first criteria threshold." Claim 27, from which claim 28 depends, has been amended to address this rejection, and the undersigned respectfully requests that this rejection be withdrawn.

Rejection of Claims 27, 29 and 31-42 under 35 U.S.C. § 103(a)

The Office has rejected claims 27, 29, and 31-42 under 35 U.S.C. § 103(a) in light of various references.

Claims 27 and 31 are independent claims. Rejected claim 29 depends from claim 27, and rejected claims 32-42 depend from claim 31. The office has rejected claims 27 and 31 under 35 U.S.C. § 103(a) as being unpatentable over Yi-Hsing Tseng (Spectral Mixture Analysis of Hyperspectral Data) in view of Eugene W. Martin (Measurement of Impervious Surface Area from Landsat Thematic Mapper Data using Spectral Mixture Analysis).

Regarding claim 27, the Examiner states that Tseng discloses a process for determining at least one candidate spectral endmember within an image composed of multiple pixels of spectral

data, and further states that Tseng discloses all of the claimed limitations except for ordering of candidate spectra. The undersigned respectfully disagrees with the Examiner's assertions with regard to the material disclosed by Tseng. Specifically, Tseng does not disclose a process for determining a candidate spectral endmember for use in spectral unmixing of data. Tseng is directed to assessing the validity of the spectral unmixing technique in general and, in fact, assumes the existence of two endmembers in making this assessment (Section 5, Spectral Unmixing Analysis). In particular, Tseng discloses spectral unmixing using two mixed materials (soil as background and a proportionally increased vegetated area in the form of leaf wedges as a foreground—see Section 4, Test Data) as endmembers in a test of the validity of linear spectral unmixing. However, Tseng does not disclose **identifying at least one candidate spectral endmember** from matched and unmatched spectra obtained by unmixing the data. Such an identification is made after the data is unmixed, as the matched and unmatched spectral data used to identify a candidate endmember are obtained from unmixing the data, and Tseng does not disclose further identification of endmembers after unmixing the data.

Among other things, claim 27 has a limitation to defining candidate spectra, which are used in the claimed process to identify at least one candidate endmember. The claim also has a limitation to unmixing data into matched and unmatched data where the unmatched data are used to define the candidate spectra. The Examiner asserts that formulas 1 and 2 of Section 2, Spectral Unmixing Based on the Linear Mixture Model of Tseng disclose unmixing spectral data into matched spectral data and unmatched spectral data. The undersigned respectfully disagrees with this assertion. Formulas 1 and 2 of Section 2 of Tseng define the linear mixture model of

reflectance data (see Section 2, Spectral Unmixing Based on the Linear Mixture Model: "This linear mixture model can be mathematically described [by formulas 1 and 2]."). In particular, formula 1 lists the reflectance data arising from the linear mixing assumption and formula 2 gives a constraint that the abundances (or fractions of each endmember contained within the data) encompass all of the data. Although Tseng discloses linear spectral unmixing, Tseng does not disclose unmixing data into **matched spectral data and unmatched spectral data** where the matched spectral data is determined from at least a first criteria. In fact, in this regard Tseng discloses nothing further than unmixing data. Unmixing data is simply part of one limitation of claim 27.

In claim 27, candidate spectra are identified through use of a metric value range. The Examiner also asserts that formulas 1 and 2 along with an error value presented by Tseng disclose the claimed limitation of defining a metric value range, wherein the unmatched spectral data having first metric values within the range are defined as candidate spectra. Respectfully, the undersigned submits that Tseng defines neither a metric value **range** nor the use of a range to identify unmatched spectra as **candidate spectra**. Tseng acknowledges an error to account for reflectance that is not modeled by the linear mixture model and for observation noise, but does not utilize this error further to identify candidate spectra.

To identify a candidate endmember from the candidate spectra, claim 27 has a limitation of calculating a second metric value for each of the candidate spectra, wherein the second metric value combines the frequency of occurrence of each of the candidate spectra, wherein the candidate spectra having the largest second metric value is the at least one candidate endmember.

The Examiner further states that figure 12 and the fourth paragraph of Section 5, Spectral Unmixing Analysis, of Tseng disclose this limitation. Again, the undersigned respectfully disagrees. Tseng does not address the problem of identifying candidate endmembers after an initial unmixing of the data, nor does Tseng utilize **candidate spectra** in any way. Instead, Tseng makes an assessment of the accuracy of linear spectral unmixing of a known scene with two endmembers and proposes weighted least squares as a way of improving the accuracy of the unmixing computation for a fixed number of endmembers. Tseng does not, however, disclose identifying **at least one candidate endmember** based on the output of the unmixing process.

The Office stated that the same arguments justifying the rejection of claim 27 also justified rejection of claim 31. As a result, the undersigned submits with respect to claim 31 the same arguments submitted above with respect to claim 27.

Because Tseng does not disclose the limitations that the Examiner has asserted with respect to claim 27 or claim 31, the combination of Tseng with Martin does not disclose all of the limitations of either claim 27 or claim 31. As a result, the undersigned submits that the rejections of these claims should not stand and respectfully requests the Examiner to withdraw them. Because claim 29 depends from claim 27 and claims 32-42 depend from claim 31, the combination of Tseng with the other asserted references likewise does not disclose all of the limitations of any of these claims, and the undersigned respectfully requests that the Examiner also withdraw the rejections of claims 29 and 32-42 upon withdrawal of the rejections of claims 27 and 31.


CONCLUSION

The undersigned thanks the Examiner for stating that claims 28 and 30 would be allowable if rewritten to address the asserted rejections. The undersigned also respectfully submits that the arguments and amendment presented herein demonstrate that claims 27-42 are in condition for allowance except for the double patenting rejection and respectfully requests notice to this effect. Upon such notice, the undersigned will then timely and appropriately respond to the double patenting rejection. Should the Examiner determine that any further action is necessary to place this application into better form, the Examiner is encouraged to contact the undersigned at the number listed below. In addition, if any additional fees are required in connection with the filing of this response, the Commissioner is hereby authorized to charge the same to Deposit Account No. 501458.

Respectfully submitted,

Date: 1/21/05

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